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**ABSTRACT**

The present invention is a method of processing seismic data in which one or more seismic vibrators are activated with one or more pilot signals and vibrator motions are recorded along with seismic data. Vibrator signatures are computed from measured vibrator motions, such as the ground force signal. A desired impulse response is specified from either a measured vibrator motion or from test data or field data from a location near the location from which the seismic data was acquired. A deconvolution filter is computed from the impulse response and the vibrator signature. Alternatively, a single separation and deconvolution filter is derived from the impulse response and from vibrator signatures from multiple vibrators and sweeps. The deconvolution or deconvolution and separation filter is used to process the seismic data. The vibrators are then moved to a new location, and the activation is repeated.